CLAIMS

What is Claimed is:

1. A method for optimizing an estimate of a depth map of a reference image through the blending of a plurality of depth maps, taken two depth maps at a time, comprising:

calculating the reprojection energies of assigning each of two adjacent pixels of a reference image to each of two separate depth maps;

calculating the discontinuity energies associated with each pixel of the adjacent pixels of the reference image and associated with the edge between the adjacent pixels of the reference image; and

assigning depth map values for the two adjacent pixels based on a minimum graph cut between the two separate depth maps, given the adjacent pixels and the calculated reprojection and discontinuity energies.

2. The method according to claim 1, wherein the step of assigning depth map values further includes:

adjusting the calculated reprojection energies with the calculated discontinuity energies;

determining the energy costs associated with assigning the two separate depth maps to the adjacent pixels; and

assigning depth map values for the two adjacent pixels based on the minimum energy cost associated with assigning the two separate depth maps to the adjacent pixels.

3. The method according to claim 1, wherein the two separate depth maps consist of a first, estimated depth map and a second, hypothetical depth map and wherein the step of assigning depth map values includes replacing depth map values of the first, estimated depth

map to produce a third, optimized depth map which then becomes the first, estimated depth map for subsequent optimization iterations.

4. The method according to claim 3, wherein the second, hypothetical depth map is a complex, non-planar depth map.

5. The method according to claim 3, wherein the two adjacent pixels constitute a neighboring pixel pair.

6. The method according to claim 5, further including repeating the steps of calculating the reprojection energies, calculating the discontinuity energies, and assigning depth map values for each pixel pair of the reference image until the difference between the depth map values assigned at each iteration of the reference image pixel pair set reaches a predetermined minimum.

7. The method according to claim 6, further including deriving a new second, hypothetical depth map for further processing when the difference between the depth map values assigned at each iteration of a reference image pixel pair set reaches a predetermined minimum.

8. A method for estimating a depth map of a reference image through the blending of a plurality of depth maps, taken two depth maps at a time, comprising:

estimating a current depth map of a specific view of a reference image; and

for each of a plurality of derived hypothetical depth maps of the reference image, performing the following:

for each pixel on the current depth map that corresponds to a pixel on the hypothetical depth map, comparing the depth map value of the pixel on the current depth map with the depth map value of the pixel on the hypothetical depth map; and

replacing the depth map value of the pixel on the current depth map with the corresponding depth map value of the pixel on the hypothetical depth map if the compared depth map value of the pixel on the hypothetical depth map has a higher probability of accurately representing the reference image than does the compared depth map value of the pixel on the current depth map.

9. The method according to claim 8, wherein the view each of the plurality of hypothetical depth maps includes at least a subregion of the view of the current depth map.

10. The method according to claim 8, wherein one or more of the plurality of hypothetical depth maps is a complex, non-planar depth map.

11. The method according to claim 8, wherein the comparing of depth map values is terminated once the difference between the depth map values of the current depth map and the depth map values of the derived hypothetical depth map reaches a predetermined minimum.

12. The method according to claim 8, wherein the comparing of depth map values is performed a plurality of times across all pixels of the reference image until the difference between the depth map values of the current depth map and the depth map values of the derived hypothetical depth map reaches a predetermined minimum.

13. The method according to claim 8, wherein the probability of accurately representing the reference image is determined according to a Bayesian framework.

14. The method according to claim 13, wherein the probability of accurately representing the reference image is determined according to energy costs and graph cuts.

15. A method for optimizing an estimate for a depth map of a reference image of an object, comprising:

estimating a first depth map of a desired view of a reference image of an object; and

for each of a plurality of derived hypothetical depth maps of the reference image, performing the following:

for every pixel within both the first depth map and the derived hypothetical depth map, applying a Bayesian probability framework to determine the optimum depth map value between the two depth maps, wherein said determination is accomplished by minimizing the energy costs associated with graph cuts between neighboring pixel pairs; and

replacing the depth map value in the first depth map with the optimum depth map value.

16. A system for optimizing an estimate of a depth map of a reference image through the blending of a plurality of depth maps, taken two depth maps at a time, comprising:

a first processor calculating the reprojection energies of assigning each of two adjacent pixels of a reference image to each of two separate depth maps;

a second processor calculating the discontinuity energies associated with each pixel of the adjacent pixels of the reference image and associated with the edge between the adjacent pixels of the reference image; and

a third processor assigning depth map values for the two adjacent pixels based on a minimum graph cut between the two separate depth maps, given the adjacent pixels and the calculated reprojection and discontinuity energies.

17. The system according to claim 16, wherein the third processor further includes:

a fourth processor adjusting the calculated reprojection energies with the calculated discontinuity energies;

a fifth processor determining the energy costs associated with assigning the two separate depth maps to the adjacent pixels; and

a replacement device assigning depth map values for the two adjacent pixels based on the minimum energy cost associated with assigning the two separate depth maps to the adjacent pixels.

18. A system for estimating a depth map of a reference image through the blending of a plurality of depth maps, taken two depth maps at a time, comprising:

a first processor estimating a current depth map of a specific view of a reference image; and

a second processor comprising the following for each of a plurality of derived hypothetical depth maps of the reference image:

a third processor comprising the following for each pixel on the current depth map that corresponds to a pixel on the hypothetical depth map:

a comparison device comparing the depth map value of the pixel on the current depth map with the depth map value of the pixel on the hypothetical depth map; and

a replacement device replacing the depth map value of the pixel on the current depth map with the corresponding depth map value of the pixel on the hypothetical depth map if the compared depth map value of the pixel on the hypothetical depth map has a higher probability of accurately representing the reference image than does the compared depth map value of the pixel on the current depth map.

19. The system according to claim 18, wherein the comparison device terminates processing once the difference between the depth map values of the current depth map and

the depth map values of the derived hypothetical depth map reaches a predetermined minimum.

20. The system according to claim 18, wherein the comparison device compares the depth map values a plurality of times across all pixels of the reference image until the difference between the depth map values of the current depth map and the depth map values of the derived hypothetical depth map reaches a predetermined minimum.

21. The system according to claim 18, wherein the probability of accurately representing the reference image is determined according to a Bayesian framework.

22. The system according to claim 21, wherein the probability of accurately representing the reference image is determined according to energy costs and graph cuts.

23. A system for optimizing an estimate for a depth map of a reference image of an object, comprising:

a first processor estimating a first depth map of a desired view of a reference image of an object; and

a second processor comprising the following for each of a plurality of derived hypothetical depth maps of the reference image:

a third processor applying a Bayesian probability framework to determine the optimum depth map value between the two depth maps for every pixel within both the first depth map and the derived hypothetical depth map, wherein said determination is accomplished by minimizing the energy costs associated with graph cuts between neighboring pixel pairs; and

a replacement device replacing the depth map value in the first depth map with the optimum depth map value.